

LISTING OF CLAIMS: No amendments made herein.

1. (PREVIOUSLY PRESENTED) A method of simulating an operation of a logical unit, comprising:

requesting a resource in which a thread manager, which controls threads each forming an execution unit of a program, makes a request for hardware resource data relating to a hardware resource needed for execution of each of threads representative of a series of functions required until the operation of said logical unit reaches completion according to a design specification of said logical unit, to a resource manager which manages said hardware resource data;

allocating a resource in which said resource manager allocates said hardware resource data meeting said request to said thread in accordance with a rule prescribed in advance; and

controlling a thread in which said thread manager controls an execution state of said thread in accordance with a result of the allocation made by said resource manager,

said thread manager and said resource manager executing said requesting, allocating, and controlling repeatedly in cooperation with each other until the execution of said thread reaches completion while dynamically allocating hardware resource data relating to necessary hardware resources to the thread by said resource manager every time the generated thread is executed simulating the operation of said logical unit to be conducted up to the completion.

2. (PREVIOUSLY PRESENTED) The method of simulating an operation of a logical unit according to claim 1, wherein said series of functions are represented in a plurality of sequential threads.

3. (PREVIOUSLY PRESENTED) The method of simulating an operation of a logical unit according to claim 1, wherein said series of functions are represented in a plurality of sequential or concurrently executed threads.

4. (PREVIOUSLY PRESENTED) The method of simulating an operation of a logical unit according to claim 1, wherein a plurality of resource managers each corresponding to said resource manager are provided in conjunction with the types of said hardware resources data, and

in said allocating a resource, each of said resource managers allocates said hardware resource data, said resource manager manages, to said thread in accordance with a local rule described in advance.

5. (PREVIOUSLY PRESENTED) The method of simulating an operation of a logical unit according to claim 1, wherein a plurality of resource managers each corresponding to said resource manager are provided in conjunction with the types of said hardware resources data and are hierarchized according to the dependence among said hardware resources data, and

in said resource allocating, the hardware resource data allocation is made in consideration of the dependence between said hardware resource data managed by one of said resource managers and said hardware resource data managed by the other resource manager lower in hierarchy than the one of said resource managers.

6. (PREVIOUSLY PRESENTED) The method of simulating an operation of a logical unit according to claim 1, wherein said resource manager monitors resource requests in said requesting a resource to make a decision on a resource request deadlock state among a plurality of threads as a result of the monitoring.

7. (PREVIOUSLY PRESENTED) The method of simulating an operation of a logical unit according to claim 1, wherein said resource manager monitors read/write requests with respect to said hardware resource data allocated by said resource request in said requesting a resource to make a decision on a competition state in read/write operation on said hardware resource data among a plurality of threads on the basis of a result of the monitoring.

8. (PREVIOUSLY PRESENTED) The method of simulating an operation of a logical unit according to claim 1, wherein said resource manager monitors the number of resource requests with respect to said hardware resource data to detect a bottleneck on said thread on the basis of a result of the monitoring.

9. (PREVIOUSLY PRESENTED) The method of simulating an operation of a logical unit according to claim 1, wherein said resource manager monitors the number of resource requests with respect to said hardware resource data to detect blocking of said resource requests on the basis of a result of the monitoring.

10. (PREVIOUSLY PRESENTED) The method of simulating an operation of a logical unit according to claim 1, wherein said thread has a budget on a time of occupancy of hardware resource data relating to a hardware resource allocated by said resource manager.

11. (PREVIOUSLY PRESENTED) The method of simulating an operation of a logical unit according to claim 1, wherein said thread has an execution time-limit on said function.

12. (PREVIOUSLY PRESENTED) A method of simulating an operation of a logical unit, comprising:

requesting a resource in which a thread manager, which controls threads each forming an execution unit of a program, makes a request for hardware resource data relating to a hardware resource needed for execution of each of a series of threads representative of functions required until the operation of said logical unit reaches completion according to a design specification of said logical unit, to a resource manager which manages said hardware resource data;

allocating a resource in which said resource manager allocates said hardware resource data meeting said request to said thread in accordance with a rule prescribed in advance;

controlling a thread in which said thread manager controls an execution state of said thread in accordance with a result of the allocation made by said resource manager,

with said thread manager and said resource manager executing said requesting, allocating, and controlling repeatedly in cooperation with each other until the execution of said thread reaches completion while dynamically allocating hardware resource data relating to necessary hardware resources to the thread by said resource manager every time the generated thread is executed, simulating the operation of said logical unit to be conducted up to the completion;

comparing a result of the simulation with an estimated value on said operation of said logical unit; and

outputting a result of the comparison to an external unit.

13. (PREVIOUSLY PRESENTED) An apparatus for simulating an operation of a logical unit, comprising:

a thread manager for controlling a thread forming an execution unit of a program; and
a resource manager for managing hardware resource data relating to a hardware resource needed for execution of said thread,

said thread manager including:

resource requesting means for making a request for hardware resource data relating to a hardware resource needed for execution of a thread representative of functions required until the operation of said logical unit reaches completion according to a design

specification of said logical unit, to said resource manager; and
thread control means for controlling an execution state of said thread in accordance with a result of a resource allocation made by said resource manager in response to the request from said resource requesting means,
said resource manager including:
resource allocating means for allocating hardware resource data relating to a hardware resource meeting the request to said thread in accordance with a rule prescribed in advance,
said thread manager and said resource manager conducting the resource request and the control of the thread execution state repeatedly in cooperation with each other until the execution of said thread reaches completion while dynamically allocating hardware resource data relating to necessary hardware resources to the thread by said resource manager every time the generated thread is executed, for simulating the operation of said logical unit to be conducted up to the completion.

14. (PREVIOUSLY PRESENTED) A computer-readable recording medium storing a program for simulation of an operation of a logical unit, the program comprising computer instructions which when executed on a computer makes the computer function as a thread manager for controlling threads each forming an execution unit of said program and as a resource manager for managing hardware resource data relating to a hardware resource needed for execution of each of threads, by:

requesting a resource in which said thread manager makes a request for hardware resource data relating to a hardware resource needed for execution of threads representative of a series of functions required until the operation of said logical unit reaches completion according to a design specification of said logical unit, to said resource manager;

allocating a resource in which said resource manager allocates said hardware resource data meeting the request to said thread in accordance with a rule prescribed in advance; and

controlling a thread in which said thread manager controls an execution state of said thread in accordance with a result of the allocation made by said resource manager,

said thread manager and said resource manager executing the requesting, the allocating, and the controlling repeatedly in cooperation with each other until the execution of said thread reaches completion while dynamically allocating hardware resource data relating to necessary hardware resources to the thread by said resource manager every time the generated thread is executed, simulating the operation of said logical unit to be conducted up to the completion.

15. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 14, wherein a plurality of resource managers each corresponding to said resource manager are provided in conjunction with the types of hardware resource data relating to hardware resources, and

in said resource allocating, each of said resource managers allocates said hardware resource data, said resource manager manages, to said thread in accordance with a local rule described in advance.

16. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 14, wherein a plurality of resource managers each corresponding to said resource manager are provided in conjunction with the types of hardware resource data relating to hardware resources and are hierarchized according to the dependence among said hardware resources data, and

in said resource allocating, the hardware resource data allocation is made in consideration of the dependence between said hardware resource data managed by one of said resource managers and said hardware resource data managed by the other resource manager lower in hierarchy than the one of said resource managers.

17. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 14, wherein said resource manager monitors resource requests in said resource requesting to make a decision on a resource request deadlock state among a plurality of threads as a result of the monitoring.

18. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 14, wherein said resource manager monitors read/write requests with respect to said hardware resource data allocated by said resource request in said resource requesting to make a decision on a competition state in read/write operation on said hardware resource data among a plurality of threads on the basis of a result of the monitoring.

19. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 14, wherein said resource manager monitors the number of resource requests with respect to said hardware resource data to detect a bottleneck on said thread on the basis of a result of the monitoring.

20. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 14, wherein said resource manager monitors the number of resource requests with respect to said hardware resource data to detect blocking of said resource requests on the basis of a result of the monitoring.

21. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 14, wherein said thread has a budget on a time of occupancy of hardware resource data relating to a hardware resource allocated by said resource manager.

22. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 14, wherein said thread has an execution time-limit on said function.

23. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 14, wherein said series of functions are represented in a plurality of sequential threads.

24. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 23, wherein a plurality of resource managers each corresponding to said resource manager are provided in conjunction with the types of hardware resource data relating to hardware resources, and

in said resource allocating, each of said resource managers allocates said hardware resource data, said resource manager manages, to said thread in accordance with a local rule described in advance.

25. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 23, wherein a plurality of resource managers each corresponding to said resource manager are provided in conjunction with the types of hardware resource data relating to hardware resources and are hierarchized according to the dependence among said hardware resources data, and

in said resource allocating, the hardware resource data allocation is made in consideration of the dependence between said hardware resource data managed by one of said resource managers and said hardware resource data managed by the other resource manager

lower in hierarchy than the one of said resource managers.

26. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 23, wherein said resource manager monitors resource requests in said resource requesting to make a decision on a resource request deadlock state among a plurality of threads on a result of the monitoring.

27. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 23, wherein said resource manager monitors read/write requests with respect to said hardware resource data allocated by said resource request in said resource requesting to make a decision on a competition state in read/write operation on said hardware resource data among a plurality of threads on the basis of a result of the monitoring.

28. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 23, wherein said resource manager monitors the number of resource requests with respect to said hardware resource data to detect a bottleneck on said thread on the basis of a result of the monitoring.

29. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 23, wherein said resource manager monitors the number of resource requests with respect to said hardware resource data to detect blocking of said resource requests on the basis of a result of the monitoring.

30. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 23, wherein said thread has a budget on a time of occupancy of hardware resource data relating to a hardware resource allocated by said resource manager.

31. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 23, wherein said thread has an execution time-limit on said function.

32. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 14, wherein said series of functions are

represented in a plurality of sequential or concurrently executed threads.

33. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 32, wherein a plurality of resource managers each corresponding to said resource manager are provided in conjunction with the types of hardware resource data relating to hardware resources, and

in said resource allocating, each of said resource managers allocates said hardware resource data, said resource manager manages, to said thread in accordance with a local rule described in advance.

34. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 32, wherein a plurality of resource managers each corresponding to said resource manager are provided in conjunction with the types of hardware resource data relating to hardware resources and are hierarchized according to the dependence among said hardware resources data, and

in said resource allocating, the hardware resource data allocation is made in consideration of the dependence between said hardware resource data managed by one of said resource managers and said hardware resource data managed by the other resource manager lower in hierarchy than the one of said resource managers.

35. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 32, wherein said resource manager monitors resource requests in said resource requesting to make a decision on a resource request deadlock state among a plurality of threads on a result of the monitoring.

36. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 32, wherein said resource manager monitors read/write requests with respect to said hardware resource data allocated by said resource request in said resource requesting to make a decision on a competition state in read/write operation on said hardware resource data among a plurality of threads on the basis of a result of the monitoring.

37. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 32, wherein said resource manager monitors the number of resource requests with respect to said hardware resource data to detect a

bottleneck on said thread on the basis of a result of the monitoring.

38. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 32, wherein said resource manager monitors the number of resource requests with respect to said hardware resource data to detect blocking of said resource requests on the basis of a result of the monitoring.

39. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program to claim 32, wherein said thread has a budget on a time of occupancy of hardware resource data relating to a hardware resource allocated by said resource manager.

40. (PREVIOUSLY PRESENTED) The computer-readable recording medium storing a computer-readable program according to claim 32, wherein said thread has an execution time-limit on said function.

41. (PREVIOUSLY PRESENTED) A computer-readable recording medium storing a computer-readable program for simulation of an operation of a logical unit, the program comprising computer instructions which when executed on a computer makes the computer execute:

requesting a resource in which a thread manager, which controls threads each forming an execution unit of a program, makes a request for hardware resource data relating to a hardware resource needed for execution of each of threads representative of functions required until the operation of said logical unit reaches completion according to a design specification of said logical unit, to a resource manager which manages said hardware resource data;

allocating a resource in which said resource manager allocates said hardware resource meeting said request to said thread in accordance with a rule prescribed in advance;

controlling a thread in which said thread manager controls an execution state of said thread in accordance with a result of the allocation made by said resource manager,

said thread manager and said resource manager executing the requesting, the allocating, and the controlling repeatedly in cooperation with each other until the execution of said thread reaches completion while dynamically allocating hardware resource data relating to necessary hardware resources to the thread by said resource manager every time the generated thread is executed, simulating the operation of said logical unit to be conducted up to the completion;

MAY. 17. 2006 6:10PM STAAS & HALSEY 202-434-1501

NO. 2182 P. 13/18

Serial No. 09/964,591

comparing a result of the simulation with an estimated value on said operation of said logical unit; and

outputting a result of the comparison to an external unit.